

VI.5.3C-FCEXEC-MODS PROGRAM FCST FUNCTION FCEXEC RUN TIME MODIFICATIONS (MODS)

Bookmarks

Purpose	[Bookmark]
MOD Input Structure	[Bookmark]
Basic MOD Input Structure	[Bookmark]
General MOD Input Formats	[Bookmark]
MOD Format A	[Bookmark]
MOD Format B	[Bookmark]
MOD Syntax Rules	[Bookmark]
Control of Units and Timing Information for MOD Input	[Bookmark]
Rules for Applying MODs	[Bookmark]
Available MODs	[Bookmark]
MOD Input and Examples	[Bookmark]
Tables	[Bookmark]
Figures	[Bookmark]
[Bottom]	

Contents

	Page
Purpose	1
MOD Input Structure	2
Basic MOD Input Structure	2
General MOD Input Formats	3
MOD Format A	3
MOD Format B	5
MOD Syntax Rules	6
Control of Units and Timing Information for MOD Input	7
Rules for Applying MODs	7
Available MODs	9
MOD Input and Examples	9

[\[Next\]](#) [\[Previous\]](#) [\[Bookmarks\]](#) [\[Top\]](#)

Purpose

Run time modifications (MODs) are used by Function FCEXEC to make changes to time series or carryover values.

The MODs are used at forecast execution time to adjust these values in an attempt to improve the results of the forecast model computations. MODs are also available for making temporary or permanent changes to selected parameters. MODs have been provided to change only parameters that have considerable variability such as the unit hydrograph shape, AI correction factor and baseflow recession for use with API models. Most parameters can be changed only through the Segment redefinition command in the Forecast Component Initialization Program (FCINIT). Even though most MODs are used to make temporary changes the effects of these changes are made permanent whenever MODs are included and carryover is saved for dates after the modifications.

Run time control of general Function FCEXEC options (e.g. snow/no snow, length of forecast period, save carryover) is through Techniques which can be changed using HCL commands. MODs are usually for a more specific purpose and/or require the input of more information than can be easily accomplished through Techniques. The input structure of MODs is command oriented.

A very important feature of the MODs input is that each of the MODs has a date (or range of dates) associated with it. This mechanism insures that the MODs are applied only for the time intended. Warning messages inform the user when MODs are included for dates outside the current run period. This means that MOD cards can be kept until they can no longer be used but are applied only when the specified dates is included in the run. Once the dates associated with a MOD are prior to the oldest carryover save date the MOD can no longer be used and should be deleted.

When different users are assigned to the various Forecast Groups that make up the user area each user can use whatever MODs they determine are appropriate for their assigned river basins. When the results for those river basins are finalized the MODs for the Forecast Group can be included with the save carryover run for the entire user area. In this way the changes each user makes can easily be assimilated in the final complete user area run.

[\[Next\]](#) [\[Previous\]](#) [\[Bookmarks\]](#) [\[Top\]](#)

MOD Input Structure

Run-time Modifications for the FCEXEC Function have been designed to minimize the required user input while allowing flexibility in those parameter, carryover or time series values which can be changed.

MOD input can be provided to Function FCEXEC either directly within the HCL stream or read from a file. The INCLUDE MOD is used to include records from a file and is described in VI.5.3C-FCEXEC-MOD-INCLUDE [\[Hyperlink\]](#).

[\[Next\]](#) [\[Previous\]](#) [\[Bookmarks\]](#) [\[Top\]](#)

Basic MOD Input Structure

The structure of MOD input consists of a single card which contains the MOD command as the first field. This is followed by one or more subsequent cards each of which contains an identifier or range of identifiers specifying for which Segments or Forecast Groups the MOD applies and other information needed to process the MOD.

If a range of identifiers is specified then the MOD is applied starting at the first Segment identifier and stopped after the second Segment identifier and is applied to all Segments that occur in the computational order between the identifiers.

In a few cases the first (or command) card for each MOD contains only the command preceded by a period. However there are several

additional fields on most command cards. These additional fields specify the date or dates for which the command applies and whether the identifiers on subsequent cards are Segment or Forecast Group identifiers.

The remaining cards for each MOD command start with an identifier or range of identifiers as the first field followed with information needed to execute the MOD command. These subsequent cards can be repeated under one MOD command card.

[\[Next\]](#) [\[Previous\]](#) [\[Bookmarks\]](#) [\[Top\]](#)

General MOD Input Formats

There are two general input formats for the current MODs:

- o Format A is used to change time series values
- o Format B is used to make changes associated with Operations

[\[Next\]](#) [\[Previous\]](#) [\[Bookmarks\]](#) [\[Top\]](#)

MOD Format A

This format is used to change values in time series.

Command Card

The command card for Format A contains the MOD command preceded by a period as the first field on the card. Depending on the command there may be zero, one or two additional fields. If required the additional fields are dates specifying when the changes apply.

```
.command [ date1 ] [ date2 ] [ date3 ]
```

```
where command is the name of name of the MOD
      date1   is either:
                  the date for which changes apply if only one
                  date is entered
                  or
                  the starting date for changes if two dates
                  are entered
      date2   is the ending date for changes
      date3   is the date after which the MOD is no longer
              valid
```

Subsequent Cards

The formats for subsequent cards for Format A are:

Format A1

```
segid tsid datatype timeint date
```

```
where segid      is the Segment identifier
```

tsid	is the time series identifier
datatype	is the data type
timeint	is the time interval
date	is the date or range of dates for which the MOD applies

Format A2

```
segid  tsid  datatype  timeint  values  ( keyword
                                     optype opname )
```

where	segid	is the Segment identifier
	tsid	is the time series identifier
	datatype	is the data type
	values	are the value or values to be used for changes

keyword, optype and opname are described below

Keywords, Operation Types and Operation Names for Format A2

Format A2 allows either a keyword or an optype to be entered to determine when the change to the time series will occur. The rules governing when one of these entries is required and the defaults if no entry is made are described below.

There are four types of time series used by the Forecast Component which can be changed with MOD command format A2:

- o INPUT time series are read from file and used by the Forecast Component
- o OUTPUT time series are generated by the Forecast Component and written to the file
- o UPDATE time series are read from file, used by the Forecast Component and written back to file
- o INTERNAL time series are only used within a Segment by the Forecast Component and do not reside on any file

Valid keywords are FIRST or LAST (abbreviated F or L). FIRST means change the time series just after it is read from file before performing any Forecast Component computations. LAST means change the time series after all Forecast Component computations just before writing to the file. If an optype (e.g. SAC-SMA, UNIT-HG, etc.) is entered it means to change the time series just before any occurrence of that Operation type in the Operations Table. An optype may be followed by an opname indicating that the time series is to be changed only before the particular Operation named. The following rules apply:

- o For INPUT time series only FIRST or an optype are valid. If no entry appears FIRST is assumed.

- o For OUTPUT time series only LAST or an optype are valid. If no entry appears LAST is assumed.
- o For UPDATE time series FIRST, LAST or an optype is required.
- o For INTERNAL time series an optype is the only valid entry. It is required.
- o If keywords FIRST or LAST are entered they are the last field on the card. An optype may be followed by an opname. If an opname is not specified the time series is changed before every occurrence of Operation optype in the segment.

[[Next](#)] [[Previous](#)] [[Bookmarks](#)] [[Top](#)]

MOD Format B

This format is used to make changes associated with specific Operations.

Command Card

The command card for Format B contains the MOD command preceded by a period as the first field on the card. For most of the Format B MODs the last field of the command card is optional and is used to specify whether the identifiers on subsequent cards are Segment identifiers or Forecast Group identifiers. Forecast Group identifiers cannot be specified for some Format B MODs. When valid the last field on the command card must be the word FGROUP (abbreviated FG) to designate that the identifiers on subsequent cards are Forecast Group identifiers. If this field is not entered the identifiers are treated as Segment identifiers. Depending on the command there may be zero, one or two additional fields. If required the additional fields are dates specifying when the changes apply. These additional fields (if needed) must be entered between the MOD command and the optional word FGROUP.

```
.command [ date1 ] [ date2 ] [ date3 ] [ FGROUP ]
```

```

where command is the name of the MOD
      date1   is either:
                  the date for which changes apply if only one
                  date is entered
                  or
                  the starting date for changes if two dates
                  are entered
      date2   is the ending date for changes
      date3   is date after which the MOD is no longer valid
      FGROUP  indicates that the identifiers on subsequent
                  cards are Forecast Group identifiers instead
                  of the default of Segment identifiers

```

Subsequent Cards

The formats for subsequent cards for Format B are:

Format B1

identifier keyword date [/ opname]

where identifier is a single Segment or Forecast Group identifier depending on the entry of field FGROUP on the command card or a range of Segment or Forecast Group identifiers in the form id-id (i.e. one field with a dash separating the two identifiers)

keyword	is described with the MOD command
date	is described with the MOD command
opname	is a specific Operation name which is an optional field. This field indicates the particular Operation within a Segment (or Forecast Group) for which the MOD applies. If this field is not entered the MOD applies to all Operations in the Segment or Forecast Group of the type being changed by the MOD command currently being executed. If this field is entered it must be preceded by a field which is a slash (/).

Format B2

identifier keyword value [/ opname]

where identifier	is as described in Format B1
keyword	is described with the MOD command
value	is described with the MOD command
opname	is as described in Format B1

Format B3

identifier values [/ opname]

where identifier	is as described in Format B1
value	is described with the MOD command
opname	is as described in Format B1

[\[Next\]](#) [\[Previous\]](#) [\[Bookmarks\]](#) [\[Top\]](#)

MOD Syntax Rules

The following are the syntax rules for the format of MOD cards:

- o Input is in free format which means that commands or data need not be in specified columns on the card. The input consists of fields separated by blanks or a comma. A field containing blanks or commas can be entered by enclosing it in single quotes. No field containing a single quote can be entered.

- o Columns 1 through 72 are available to enter data. Continuation cards can be specified by entering an ampersand (&) as the last field of the card to be continued. Fields cannot be split between two cards.
- o Commands (with a decimal point as the first character of the field) must be the first field on a card.
- o When an optional field is after a slash (/) the slash must be surrounded by blanks or commas.
- o The form of all date fields is the same as other date fields except that dates containing asterisks (*) are not allowed. See Section VI.5.2B [[Hyperlink](#)] for the date format.
- o Data values to be repeated can be specified in a single field in the form n*value where n is the repeat factor.
- o Groups of data values can be repeated by entering them with a format of n*(val1 val2 val3 ...) where n is the repeat factor. Spaces are not allowed around the left parenthesis or before the right parenthesis. Values within the parentheses can be repeating fields as shown in syntax rule 6. Repeating data groups cannot be nested.

[[Next](#)] [[Previous](#)] [[Bookmarks](#)] [[Top](#)]

Control of Units and Timing Information for MOD Input

Technique MODUNITS is used to specify the units of data input to most MOD commands. Units of data input to MOD commands which change carryover or parameters for the Sacramento and Xinanjiang soil moisture accounting Operations are determined from Technique MODSACUN. The input data units for MOD commands which change the API Operations are specified by Technique MODAPIUN.

The time zone assumed when a date is entered with an hour but no time zone as MOD input can be specified though Technique MODTZC. If a date with no hour is input the hour is set to the start of the hydrologic day (12Z).

See Section VI.5.3D [[Hyperlink](#)] for a complete description of these Techniques.

[[Next](#)] [[Previous](#)] [[Bookmarks](#)] [[Top](#)]

Rules for Applying MODs

The following rules are used to determine which MODs are applied:

- o Multiple MODs for the same time interval: When there is more than one MOD that applies to the same time interval:
 1. Depends on what the MOD is doing:
 - a. value is being replaced - only one MOD applies per time

- interval
- B. value is being multiplied - all values are applied (i.e. the result is the product of all of the multiplication factors) except in the case of the melt factor correction MOD (MFC) where only one value applies
- c. value is being added - all values are applied (i.e. the total amount added is the sum of all of the MOD values)

2. Depends on whether the MOD is explicitly specified:

MODS that affect Operations or Rating Curves generally affect all Operations of that type in a Segment or all Rating Curves. Also a MOD like MATCHNG [[Bookmark](#)] will affect all MAT time series in a Segment. The MOD can be made to apply only to a specific Operation, Rating Curve or time series by using the '/opname', '/rcid', or 'tsid' field on the MOD card. Explicitly specified MODs take precedence over non-explicit MODs.

3. Depends on the order:

If everything else is the same for replacements MODs then the last one is used.

o Use of the validdatetime field:

In general, changes made to future values are valid at the time the forecast is made. The forecasted changes for one time should not override values based on observations at a subsequent time. The validdatetime field is used to specify the time at which changes made to forecast values are valid. Most MODs that allow changes in the future require the use of the validdatetime field. For MODs that use the validdatetime field, changes to values in the future are made only when the validdatetime is the same as the end of the observed data period (Technique LSTCMPDY [[Hyperlink](#)]). At subsequent forecast times when validdatetime is before LSTCMPDY, only the changes at or prior to validdatetime are applied. Figure 1 [[Bookmark](#)] shows the use of the validdatetime option.

o MODs that overlay the run period:

When there are MODs that specify changes to the time series or model output that span a period that is partly within and partly outside of the run period then the part of the MOD that is within the run period is used and the part that is outside is ignored. In general, when dealing with time periods, the period is specified by the hour at the end of the time period. If dates on MODs are within a time period then they are usually moved to the closest period ending hour. In a few cases, such as the AEICQN [[Bookmark](#)] and BFRCHNG [[Bookmark](#)] MODs, they are moved to the ending hour of the period in which they fall.

[[Next](#)] [[Previous](#)] [[Bookmarks](#)] [[Top](#)]

Available MODs

A list of the available MODs is in Table 1 [[Bookmark](#)].

[\[Next\]](#) [\[Previous\]](#) [\[Bookmarks\]](#) [\[Top\]](#)

MOD Input and Examples

The location of the MOD cards in the input stream is:

```
@SETOPTIONS
.
Technique input cards
.
MOD
.
MOD input cards
.
ENDMOD
@COMPUTE FCEXEC
.
@STOP
```

The Technique input includes the type of run to be made (Carryover Group, Forecast Group or single Segment) and overrides of default values for the other Techniques.

The Technique input section indicates either by default or by including Technique cards, the units of input for the MODs and the default time zone to be used when the time zone is not specified in the date fields of a MOD card.

The following documents contain the purpose, input format and examples for each MOD.

In the examples:

- o units for the SACCO MOD are Metric
- o units for all other MODs are English
- o the default time zone used is CST

Table 1. Available MODs

	<u>Name</u>	<u>Format</u>	<u>Dates</u>	<u>FG 1/</u>	<u>Perm 2/</u>	<u>Description</u>	[Back]
1.	AEICQN	B3	1	yes	no	Changes the Antecedent Evaporation Index (AEI) value in API Operations [Hyperlink]	
2.	AESCCHNG	B3	1	yes	no	Changes the value of the areal extent of snow cover for SNOW-17 Operations [Hyperlink]	
3.	AIADJ	B3	1	yes	yes	Changes the AI adjustment factor for API Operations [Hyperlink]	
4.	APICBASf	B3	1	yes	no	Multiplies the baseflow runoff from Operation API-CONT by a constant [Hyperlink]	
5.	APICCO	B3	1	yes	no	Changes the Operation API-CONT carryover values [Hyperlink]	
6.	APICQN	B3	1	yes	no	Changes the API value in event API Operations [Hyperlink]	
7.	BASEF	B3	1	no	no	Changes the recessing baseflow amount in baseflow Operations (value entered as flow) [Hyperlink]	
8.	BFRATE	B3	1	yes	no	Changes the recessing baseflow amount in baseflow Operations (value entered as flow per area) [Hyperlink]	
9.	BFRCHNG	B3	1	yes	yes	Changes the recession factor for baseflow Operations with a single recession factor [Hyperlink]	[Back]
10.	BUBLSHFT	B3	2	no	no	Shifts the Rating Curve by specifying a new stage, discharge point and upper and lower stage values	

<u>Name</u>	<u>Format</u>	<u>Dates</u>	<u>FG 1/</u>	<u>Perm 2/</u>	<u>Description</u> [Hyperlink]
11. CBASEF	B3	1	no	yes	Changes the constant baseflow amount for baseflow Operations (value entered as flow) [Hyperlink]
12. CBFRATE	B3	1	yes	yes	Changes the constant baseflow amount for baseflow Operations (value entered as flow per area) [Hyperlink]
13. CHGBLEND	B3	1	yes	yes	Changes the length of blending period in Operation ADJUST-Q [Hyperlink]
14. IGNORETS	B2	2	yes	no	Sets which types of data are to be ignored by Operations ADJUST-Q and RES-SNGL [Hyperlink]
15. INCLUDE	N/A	N/A	N/A	N/A	Includes MOD statements from a files [Hyperlink]
16. MATCHNG	B2	2	yes	no	Changes values in MAT time series [Hyperlink] [Back]
17. MFC	B3	2	yes	no	Changes the melt factor correction value for Operation SNOW-17 [Hyperlink]
18. QCSHIFT	B3	2	no	no	Shifts a Rating Curve by a constant discharge amount for a specified period [Hyperlink]
19. QPSHIFT	B3	2	no	no	Shifts a Rating Curve by a percent discharge amount for a specified period [Hyperlink]
20. RAINSNOW	B1	0	yes	no	Sets whether precipitation during a period is rain or snow [Hyperlink]
21. ROCHNG	B3	1	yes	no	Changes the runoff values just before a unit

<u>Name</u>	<u>Format</u>	<u>Dates</u>	<u>FG 1/</u>	<u>Perm 2/</u>	<u>Description</u>
					hydrograph Operation [Hyperlink]
22. ROMULT	B3	2	yes	no	Multiplies runoff values by a constant just before a unit hydrograph Operation [Hyperlink]
23. RRICNG	B3	1	yes	no	Changes the moisture input time series to a rainfall/runoff model [Hyperlink]
24. RRIMULT	B3	2	yes	no	Multiplies the moisture input time series to a rainfall/runoff model by a specified value [Hyperlink]
25. SACBASEF	B3	1	yes	no	Multiplies the baseflow runoff from the SAC-SMA model by a constant [Hyperlink]
26. SACCO	B2	1	yes	no	Changes the SAC-SMA soil moisture carryover values [Hyperlink]
27. SETMSNG	A1	0	no	no	Sets values in a time series to missing [Hyperlink]
28. SETQMEAN	B3	1	no	no	Overrides rules specified in Operation RES-SNGL with mean flow values entered [Hyperlink]
29. SSARREG	B2	1	no	no	Sets regulation values to Operation SSARRESV [Hyperlink]
30. SWITCHTS	B2	3	yes	no	Indicates that the secondary time series defined for a MERGE-TS Operation to be used as input [Hyperlink]
31. TSADD	A2	2	no	no	Adds a constant to values in a time series [Hyperlink]
32. TSCHNG	A2	1	no	no	Changes the values in a

<u>Name</u>	<u>Format</u>	<u>Dates</u>	<u>FG 1/</u>	<u>Perm 2/</u>	<u>Description</u>
					time series [Hyperlink]
33. TSMULT	A2	2	no	no	Multiplies the values in a time series by a constant [Hyperlink]
34. TSREPL	A2	2	no	no	Replaces values in a time series with a constant [Hyperlink]
35. UADJ	B3	2	yes	no	Multiplies the average wind function adjustment (UADJ) parameter for Operation SNOW-17 [Hyperlink]
36. UCBASEF	B3	1	no	yes	Changes the constant baseflow amount for unit hydrograph Operations (value entered as flow) [Hyperlink]
37. UCBFRATE	B3	1	yes	yes	Changes the constant baseflow amount for unit hydrograph Operations (value entered as flow per area) [Hyperlink]
38. UHGADJ	B2	1	yes	no	Changes a unit hydrograph with horizontal and/or vertical adjustment factors [Hyperlink]
39. UHGCDATE	B3	3	no	no	Changes the ordinates of a unit hydrograph for a specified part of the run period [Hyperlink]
40. UHGCHNG	B3	1	no	no	Changes the ordinates of a unit hydrograph for the entire run period [Hyperlink]
41. WEADD	B3	1	yes	no	Adds the value of snow water equivalent for a specified date [Hyperlink]
42. WECHNG	B3	1	yes	no	Changes the value of snow water equivalent for a specified date [Hyperlink]
43. WEUPDATE	B2	1	yes	no	Changes the snow water

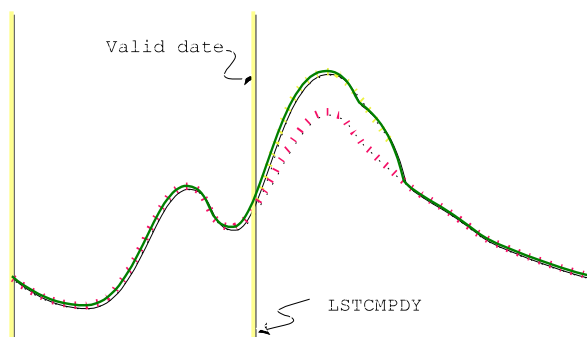
[\[Back\]](#) [\[Next\]](#) [\[Previous\]](#) [\[Bookmarks\]](#) [\[Top\]](#)

<u>Name</u>	<u>Format</u>	<u>Dates</u>	<u>FG 1/</u>	<u>Perm 2/</u>	<u>Description</u>
					equivalent and the associated variance or gain to be used in Kalman filtering updating [Hyperlink]
44. XINCO	B2	1	yes	no	Changes the Operation XIN-SMA soil moisture carryover values [Hyperlink]
45. ZERODIFF	B2	1	no	no	Resets the carryover in Operation ADJUST-Q at the start of the run [Hyperlink]

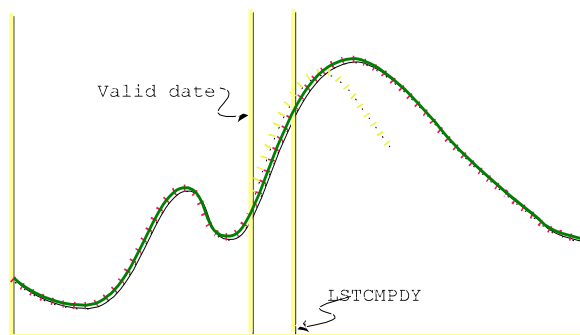
Notes:

- 1/ Indicates whether Forecast Group identifiers can be specified.
- 2/ Indicates whether the change is permanent in program FCST (none are permanent in program IFP). If the change is permanent then the value stored in the Forecast Component parameter file is changed.

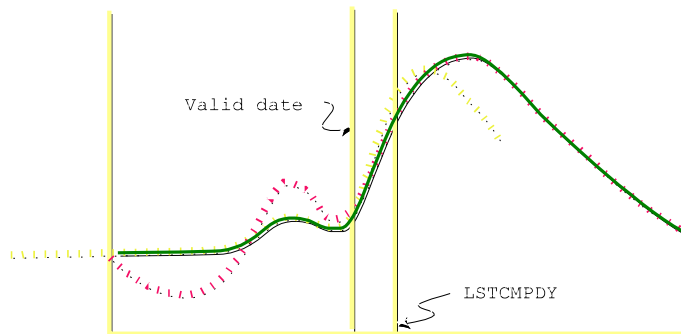
Figure 1. MODs and the validdate field



A. Valid Date Equals LSTCMPDY



B. Valid Date Less Than LSTCMPDY



C. Valid Date Used With Values That Overlap the Run Period

